

Notice No.4

Rules for the Manufacture, Testing and Certification of Materials, July 2021

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note that corrigenda amends to paragraphs, Tables and Figures are not shown in their entirety.

Issue date: June 2022

Amendments to	Effective date	IACS/IMO implementation (if applicable)
Chapter 1, Sections 5 & 6	Corrigendum	N/A
Chapter 3, Sections 3 & 10	Corrigenda	N/A
Chapter 9, Section 1	Corrigenda	N/A
Chapter 13, Sections 1 & 2	Corrigenda	N/A



Chapter 1

■ Section 5 Non-destructive examination

5.13 Phased array ultrasonic testing (PAUT)

Table 1.5.2 Specific requirements of a PAUT procedure

Requirement	Essential Variable	Nonessential Variable
Virtual aperture size (i.e. number of elements, effective height ¹ , and element width)	X	...

■ Section 6 References

6.1 General

6.1.1 The location of National and International Standards or Codes referenced in these Rules are shown in [Table 1.6.1 List of National and International Standards or Codes](#). The latest version of the standards in this table applies unless otherwise agreed. The applicable National or International Standard or Code is the one adopted by the standards organization at the time of publication of these Rules unless the applicable version or edition is specified.

Table 1.6.1 List of National and International Standards or Codes

Chapter 3 Rolled Steel Plates, Strip, Sections and Bars

■ Section 3 Higher strength steels for ship and other structural applications

3.3 Chemical composition

Table 3.3.4 Chemical composition for brittle crack arrest steels

Grades	EH36-BCA1	EH40-BCA1 EH40-BCA2	EH47-BCA1 EH47-BCA2
Grain refining elements (Note 1 & Note 2)			
Aluminium (acid soluble) % (Note 3)	0,015 min	0,015 min	0,015 min
Niobium %	0,02 – 0,05	0,02 – 0,05	0,02 – 0,05
Vanadium %	0,05 – 0,10	0,05 – 0,10	0,05 – 0,10
Titanium %	0,02 max-	0,02 max-	0,02 max-
Total (Nb + V + Ti) %	0,12 max-	0,12 max-	0,12 max-
<p>Note 2. The steel is to contain aluminium, niobium, vanadium or other suitable grain refining elements, either singly or in any combination. When used singly the steel is to contain the specified minimum content of the grain refining element. When used in combination, the specified minimum content of a fine grain refining element is not applicable.</p> <p>Note 2. The grain refining elements are to be in accordance with the approved specification.</p>			

■ **Section 10**
High strength steels for welded structures

10.3 Chemical composition

10.3.4 The carbon equivalent value is to be calculated from the ladle analysis using the formula given below. Maximum values are specified in [Table 3.10.3 Maximum Ceq, CET and Pcm values](#).

For steel grades H46 and higher, ~~CET~~ CET may be used instead of Ceq ~~Ceq~~ at the discretion of the manufacturer, and is to be calculated according to the following formula:

Table 3.10.3 Maximum Ceq, CET and Pcm values

Steel yield strength level/Condition of supply	Ceq (%)						CET (%)	Pcm (%)
	Plates			Sections	Bars	Tubulars	all	all
	t≤50 (mm)	50<t≤100 (mm)	100<t≤250 (mm)	t≤50 (mm)	t≤250 or d≤250 (mm)	t≤65 (mm)	all	all
H89TM	0,60	N/A		N/A	N/A	0,38 N/A	0,28 0,38	0,28

Chapter 9 Copper Alloys

■ **Section 1**
Castings for propellers

1.10 Weld repair procedure

1.10.4 The requirements of [Ch 12, 4.2 Requirements for copper alloys](#) are to be followed for the welding procedure qualification with the following exceptions and additions:

- (b) Bend test may be replaced with fracture test in accordance with ISO 9017. Where fracture test is used, four fracture specimens are to be tested, two extracted from the middle and two from the end of the test the weld length. The minimum length of each specimen is to be 20 mm and side notches are to be used. Fracture test results are to be assessed in accordance with the acceptance criteria specified for the ~~non-destructive examination~~ Non-Destructive Examination in [Ch 12, 2.5 Non-destructive examination \(NDE\)](#).

Chapter 13 Requirements for Welded Construction

■ **Section 1**
General welding requirements

1.11 Non-destructive examination of welds

1.11.16 In general, start/stop points in welds made using automatic welding processes (i.e. welding in which all welding operations are performed without welding operator intervention during the process and manual adjustment of welding parameters by the welding operator is not possible) or fully mechanised welding processes, these are to be examined using radiographic or ultrasonic inspection, except for internal members where the extent of testing is to be agreed with the Surveyor.

Section 2

Specific requirements for ship hull structure and machinery

2.12 Non-destructive examination of steel welds

Table 13.2.5 Acceptance criteria for visual testing, magnetic particle and liquid penetrant testing

Surface discontinuity	Classification according to ISO 6520-1	Acceptance criteria	
Surface pore	2017	Visual inspection	
		Thickness (<i>t</i>)	
		0,5 mm < <i>t</i> ≤ 3,0 mm	<i>t</i> > 3,0 mm
		Not permitted	Butt welds: $d \not\leq 0,2 t$ (max of 2,0 mm) Fillet welds: $d \not\leq 0,2 a$ (max of 2,0 mm) See Notes 4, 5, & 6.
		Liquid penetrant inspection	
		Single pore indication diameter $d \leq 6$ mm see Notes 1, 2, 3 & 4.	
		Magnetic particle inspection	
		Single pore diameter $d \leq 3$ mm see Notes 1, 3 & 4- <i>d</i> = major axis of dimension	
Undercut	5011 (Continuous)	Thickness (<i>t</i>)	
	5012 (Intermittent)	0,5 mm < <i>t</i> ≤ 3,0 mm	$t \not\geq 3,0$ mm
		Short imperfections only see Notes 7 & 8: $h \leq 0,1 t$ see Note 7-9	Short imperfections only see Notes 7 & 8: $h \leq 0,1 t$ (max 0,5 mm) see Note 7-9
		Smooth transition to parent material is required and imperfection is not to be regarded as systematic.	
	Note 7. <i>h</i> = height or width of imperfection. For either continuous or intermittent undercut, only short imperfections are allowed.		
Note 8. The definitions of short imperfections are as follows: For welds 100 mm long or longer: Imperfections whose total length is not greater than 25 mm in the 100 mm of the weld which contains the greatest number of imperfections. For welds less than 100 mm long: Imperfections whose total length is not greater than 25 per cent of the length of the weld.			
Note 9. <i>h</i> = height or width of imperfection.			

2.12.5 The method to be used for the volumetric examinations of welds is the responsibility of the builder; however, the following technical considerations shall be noted for the choice concerning the selected method:

- (d) Where there is a requirement for enhanced NDE acceptance criteria to be applied to thick plate sections in the hatch coaming region of container ships, as per the Measure 3 requirement in [Table 8.2.1 Chemical composition, percentage Preventative measures to be used in design and construction for thick steel plates](#), as described in [Pt 4, Ch 8, 2.3 Requirements for use of thick steel plates 2.3.10](#) of the [Rules and Regulations for the Classification of Ships](#), the UT and PAUT acceptance criteria are to be derived from the *ShipRight Procedure for the Use of Enhanced NDE in Container Ships*. These derived acceptance criteria are project specific, and the acceptance criteria stated in [Table 13.2.7 Acceptance criteria for ultrasonic and Phased Array testing](#) are not applicable.

Table 13.2.6 Acceptance criteria for radiographic testing

Discontinuity	Classification according to ISO 6520-1	Acceptance criteria
Lack of fusion	401	Acceptable up to but only intermittently and not breaking the surface, $\Sigma l \leq 25$ mm, $L = 100$ mm. See Notes 1 & 9.
Slag inclusions, Flux inclusions, & Oxide inclusions	301, 302 & 303	See Notes 1, 2, 4, 5 & 10-8.
Porosity & Gas pore (Single Layer)	2011 & 2012	See Notes 1, 2, 3, 4, 5, 6 & 7-10.
Porosity & Gas pore (Multi-Layer)	2011 & 2012	See Notes 1, 3, 5, 6 & 7-10.

Linear porosity	2014	$l \leq s$, max 50 mm $d \leq 0,3 s$ (max 3,0 mm) $L = 100$ mm See Notes 1, 3, 5, 6, 7 & 10.
Clustered (localised) porosity	2013	See Notes 1, 3, 5, 6, 7, 10 & 11.
Elongated cavity & wormholes	2015 & 2016	See Notes 1, 2, 4, 5, 7, 8 & 10.
Metallic inclusions other than copper	304	$l \leq 0,3 s$ (max 3,0 mm) See Notes 2 & 5.
Note 1. L = Length of indication (mm) any 100 mm testing length within the radiograph. Note 7. W_p = Width of weld or cross surface imperfection (mm). Note 11. d_A = Diameter of Pore envelope d_A = Diameter of pore envelope		

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